

Remarks

Reconsideration is requested in view of the preceding amendments and the following remarks. Claims 1-31 are pending. Claims 26 and 27 are canceled without prejudice and new claims 32-34 are submitted for consideration. Upon entry of this Amendment, claims 1-25 and 27-34 are in the application.

Claims 4 and 17 are amended to correct obvious typographical errors and to provide proper antecedent basis. Claims 3, 5, 6, 8, 12-16, and 22 are amended for clarification. Support for new claims 32-34 can be found in the specification at, for example, page 5, lines 5-12, page 9, lines 20-23, and page 19, lines 21-27. No new matter is introduced.

Claims 1-25 and 28-31 stand rejected under 35 U.S.C. §102(a) as allegedly anticipated by Ma et al., U.S. Patent 6,483,308 ("Ma"). These rejections are traversed. In order to anticipate a claim, a reference must teach each and every element of the claim either expressly or inherently. M.P.E.P. 8th ed., § 2131. The pending claims recite features that are neither taught nor suggested by Ma, and therefore are not anticipated by Ma. Moreover, Ma addresses a different problem (separating water and fat images based on their relative chemical shift) than the subject application, and thus Ma provides no teaching, suggestion, or motivation for the claimed methods and apparatus.

Claim 1 recites a method of canceling ghost artifacts that includes acquiring data using a phase encode order in which k-space distortion has components which are substantially periodic and canceling ghost artifacts in images based on the acquired data using phased array ghost cancellation processing. Ma does not teach or suggest such a method. Instead, Ma teaches a method for obtaining separate water and fat images of a subject using a so-called Dixon technique. Col. 1, lines 53-67 and Abstract. According to Ma, low resolution images can be used to calculate phase corrections, and the calculated phase corrections used to correct high resolution images. The corrected images can be combined to produce fat and water images for each coil element, and these images can be combined to form a single fat image and a single water image. Abstract. Ma is silent concerning acquiring data using a phase encode order in which k-space distortion has components which are substantially periodic and canceling ghost artifacts in images based on the acquired data using phased array ghost cancellation processing.

Because Ma fails to teach at least these features of claim 1, claim 1 and dependent claims 2-13 are properly allowable over Ma.

Dependent claims 2-13 recite additional features that are neither taught nor suggested by Ma and are therefore allowable for additional reasons. For example, claim 4 recites a phase encode order such that the k-space distortion has a rapid periodic variation, thereby trading what would be an image blurring for image ghosts which can then be canceled by the phased array ghost cancellation processing. Ma does not teach or suggest such a phase encode or trading what would be an image blurring for image ghosts. Claim 5 recites canceling the ghost artifacts by passing the images with the ghost artifacts through parallel phased array combiners. Ma does not teach or suggest passing images with ghost artifacts through parallel phased array combiners. Claim 6 recites shifting the images with the ghost artifacts. Ma fails to teach or suggest shifting images with ghost artifacts. Not only does Ma fail to teach or suggest these and other features recited in these and other dependent claims, the Office action does not mention many features recited in these and other claims, nor identify any portions of Ma that are alleged to teach or suggest such features. For example, Ma does not mention ghost artifacts or any methods or apparatus for canceling such artifacts. Applicants request that specific reasons for the rejection of each rejected claim be provided in any subsequent Office action, and that specific portions of cited references be provided for each claim feature.

Claim 14 recites system for canceling ghost artifacts in magnetic resonance imaging to produce a series of images that includes at least one shifter coupled in series between an array combiners and an image reconstructor. Ma does not teach or suggest such a shifter. Therefore, claim 14 and dependent claims 15-23 are properly allowable over Ma for at least these reasons.

Claim 24 recites a system for canceling ghost artifacts in magnetic resonance that includes a phase encode order which causes k-space distortion to be periodic with a period corresponding to widely spaced ghost artifacts. Ma does not teach or suggest such a phase encode order nor such k-space distortion, and claim 24 and dependent claim 25 are properly allowable over Ma.

Claim 28 recites a method of canceling ghost artifacts in magnetic resonance imaging that includes acquiring data using a phase encode order in which k-space distortion has components which are substantially periodic. Ghost artifacts are canceled using at least one

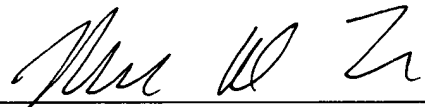
phased array combiner that receives image domain data and produces an image or series of images with ghost artifacts removed. Ma does not teach or suggest acquiring data using such a phase encode order or canceling ghost artifacts using a phased array combiner. Therefore, claim 28 and dependent claims 29-31 are properly allowable over Ma.

New claims 32-33 and 34 depend from allowable claims 1 and 14, respectively, and are therefore properly allowable. In addition, new claims 32-34 are also allowable as these claims recite additional features that are not taught or suggested by Ma.

In view of the preceding, all pending claims are in condition for allowance and action to such end is requested. If any issues remain before a Notice of Allowance is issued, the Examiner is invited to telephone the undersigned at the telephone number provided below.

Respectfully submitted,

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